



October 16, 2006

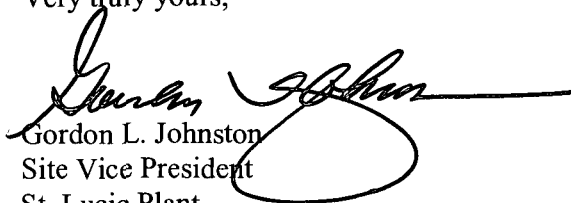
L-2006-238
10 CFR 50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Re: St. Lucie Unit 1
Docket No. 50-335
Reportable Event: 2006-003-00
Date of Event: August 16, 2006
Unanalyzed Condition for Diesel Generators and Degraded Voltage Relaying

The attached Licensee Event Report 2006-003-00 is being submitted pursuant to the requirements of 10 CFR 50.73 to provide notification of the subject event.

Very truly yours,


Gordon L. Johnston
Site Vice President
St. Lucie Plant

GLJ/dlc

Attachment

IE 22

NRC FORM 366 (6-2004)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB: NO. 3150-0104		EXPIRES: 06/30/2007	
LICENSEE EVENT REPORT (LER)							
1. FACILITY NAME St. Lucie Unit 1				2. DOCKET NUMBER 05000335		3. PAGE 1 OF 4	
4. TITLE Unanalyzed Condition for Diesel Generators and Degraded Voltage Relaying							
5. EVENT DATE			6. LER NUMBER			7. REPORT DATE	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY
08	16	2006	2006	- 003 -	00	10	16
						8. OTHER FACILITIES INVOLVED	
						FACILITY NAME	
						DOCKET NUMBER	
						FACILITY NAME	
						DOCKET NUMBER	
9. OPERATING MODE 1		11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR§: (Check all that apply)					
		<input type="checkbox"/> 20.2201(b) <input type="checkbox"/> 20.2203(a)(3)(i) <input type="checkbox"/> 50.73(a)(2)(i)(C) <input type="checkbox"/> 50.73(a)(2)(vii) <input type="checkbox"/> 20.2201(d) <input type="checkbox"/> 20.2203(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(viii)(A) <input type="checkbox"/> 20.2203(a)(1) <input type="checkbox"/> 20.2203(a)(4) <input checked="" type="checkbox"/> 50.73(a)(2)(ii)(B) <input type="checkbox"/> 50.73(a)(2)(viii)(B) <input type="checkbox"/> 20.2203(a)(2)(i) <input type="checkbox"/> 50.36(c)(1)(i)(A) <input type="checkbox"/> 50.73(a)(2)(iii) <input type="checkbox"/> 50.73(a)(2)(ix)(A) <input type="checkbox"/> 20.2203(a)(2)(ii) <input type="checkbox"/> 50.36(c)(1)(ii)(A) <input type="checkbox"/> 50.73(a)(2)(iv)(A) <input type="checkbox"/> 50.73(a)(2)(x) <input type="checkbox"/> 20.2203(a)(2)(iii) <input type="checkbox"/> 50.36(c)(2) <input type="checkbox"/> 50.73(a)(2)(v)(A) <input type="checkbox"/> 73.71(a)(4) <input type="checkbox"/> 20.2203(a)(2)(iv) <input type="checkbox"/> 50.46(a)(3)(ii) <input type="checkbox"/> 50.73(a)(2)(v)(B) <input type="checkbox"/> 73.71(a)(5) <input type="checkbox"/> 20.2203(a)(2)(v) <input type="checkbox"/> 50.73(a)(2)(i)(A) <input type="checkbox"/> 50.73(a)(2)(v)(C) <input type="checkbox"/> OTHER <input type="checkbox"/> 20.2203(a)(2)(vi) <input type="checkbox"/> 50.73(a)(2)(i)(B) <input checked="" type="checkbox"/> 50.73(a)(2)(v)(D) <input type="checkbox"/> OTHER					
10. POWER LEVEL 100%		Specify in Abstract below or in NRC Form 366A					
12. LICENSEE CONTACT FOR THIS LER							
NAME Donald L. Cecchett - Licensing Engineer						TELEPHONE NUMBER (Include Area Code) 772-467-7155	
13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT							
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT
N/A	N/A	N/A	N/A	NO			
14. SUPPLEMENTAL REPORT EXPECTED					15. EXPECTED SUBMISSION DATE		
<input type="checkbox"/> YES (If yes, complete 15. EXPECTED SUBMISSION DATE) <input checked="" type="checkbox"/> NO					MONTH DAY YEAR - - -		
ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) <p>On August 16, 2006, St. Lucie Units 1 and 2 were operating in Mode 1 at 100% power. An engineering evaluation was completed for an operational alignment of two component cooling water (CCW) or intake cooling water (ICW) pumps operating on the same electrical train. The evaluation concluded that these alignments would result in an unanalyzed condition. Administrative controls were established to address the identified condition.</p> <p>One of the apparent causes identified weaknesses in the design modification process that permitted the implementation of a plant modification resulting in a condition where two CCW pumps could load onto an emergency diesel generator (EDG) resulting in potential loss of the affected EDG. Existing EDG analyses did not include starting two CCW pumps. A second apparent cause identified latent procedural inadequacies that permitted operation of two CCW or two ICW pumps on an electrical train. This operational alignment was not evaluated as part of the degraded voltage protection scheme, and could result in the premature isolation of the offsite power circuit for a degraded voltage with loss-of-coolant accident (LOCA) condition.</p> <p>Corrective actions include procedure changes and planned modifications.</p> <p>This condition had no significant impact to the health and safety of the public.</p>							

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TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

Description of the Event

On August 16, 2006, St. Lucie Units 1 and 2 were operating at 100% power in Mode 1. During earlier simulator training a scenario was used where the 2C component cooling water (CCW) pump [EIIS:CC:P] replaced a tripped 2B CCW pump. The 2C CCW pump was mechanically aligned to train B but remained electrically aligned to train A. This resulted in operation of two CCW pumps powered from the same electrical train. It was noted that existing EDG [EIIS:EK:DG] loading calculations included the start of only one CCW pump per electrical train. On July 26, 2006, a training instructor initiated a condition report to address the acceptability of operating in this configuration with respect to EDG loading. On August 16, 2006, the preliminary evaluation was completed and concluded that the EDG was not operable in this condition. Further evaluation under extent of condition revealed that operation of two CCW pumps or two ICW pumps per electrical train could affect the degraded voltage protection system by causing premature isolation of the offsite power circuit for the affected train during a degraded voltage with concurrent LOCA scenario.

Operations established controls to ensure EDG operability and to declare the affected offsite power source inoperable during CCW or ICW pump realignments while the evaluation continued.

Cause of the Event

The apparent causes were identified to be latent weaknesses in design documentation, design modification process and inadequate procedural controls on CCW and ICW system operation that introduced unanalyzed system interactions.

Weaknesses in the design modification process permitted the implementation of a plant modification in 2003 that disabled a pump start block circuit. This resulted in a condition where two CCW pumps could load onto an emergency diesel generator (EDG), which could result in loss of the affected EDG.

Latent procedural inadequacies permitted operation of two CCW or two ICW pumps on an electrical train. This operational alignment was not evaluated as part of the degraded voltage protection scheme, and would result in the premature isolation of the offsite power circuit for the affected train during design basis LOCA conditions with the minimum 230KV Switchyard voltage. This has existed since original plant startup.

Analysis of the Event

The CCW system is arranged as two redundant essential supply header systems (designated A and B) each with a pump and heat exchanger and the capability to supply the minimum safety feature requirements during safe shutdown or loss of coolant accident (LOCA) conditions. The C pump is an installed spare and may be aligned with either header A or B by means of the cross tie valves on the suction and discharge sides of the pumps and aligning the electrical AB system buses (power and control) to the corresponding A or B buses. The alignment of the electrical power for the AB buses (both AC and DC) must correspond to the line-up of mechanical equipment (i.e., if the C pump is aligned with the A header then the electrical AB power system must be aligned with A power) for Technical Specification operability. Any misalignment between the component cooling water pump C motor power and the header motor-operated valves is annunciated in the control room. The design of the CCW System ensures that sufficient cooling capacity is available for continued operation of safety related equipment during normal and accident conditions.

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The original design of the CCW pumps included a circuit breaker trip and sequential closure on the EDG at 6 seconds after EDG breaker closure. The C CCW pump starting logic included a blocking circuit to prevent loading the C CCW pump on the EDG if another CCW pump was aligned to the same electrical bus. In order to address NRC Generic Letter (GL) 96-06 CCW system water hammer concerns, FPL implemented a modification to move the start of the CCW pumps to the first (0-second) load block of the EDGs. These modifications removed the CCW pump breaker trip and sequential loading, effectively bypassing the C CCW pump blocking circuit. Therefore, the current design of the CCW pump control circuits starts the CCW pumps immediately upon closure of the EDG breaker in a loss-of-offsite power (LOOP), LOOP/main steam line break (MSLB) or LOOP/LOCA situation.

Engineering analysis of the subject CCW operational alignment confirmed that the St. Lucie Unit 2 EDGs had sufficient capacity to start a second CCW pump on either EDG. However, operation of two CCW pumps on a St. Lucie Unit 1 EDG was found to exceed the EDG load ratings, which could potentially result in EDG failure. Therefore, for Unit 1 the affected EDG would be considered inoperable with the CCW system in this alignment. For St. Lucie Unit 1 this is considered to be an unanalyzed condition reportable pursuant to 10 CFR 50.73(a)(2)(ii)(B).

A review of plant operating procedures identified differences between the CCW and ICW system design documentation operational assumptions and plant operating procedures. Design documentation and the degraded voltage analyses assume the operation of one CCW or ICW pump per electrical train. Plant procedures allow operation of two CCW or ICW pumps on one electrical train as a transitional evolution when the system is being realigned. The operation of a second CCW or ICW pump on the same electrical train could result in prematurely isolating the offsite power circuit for the affected train during design basis LOCA conditions. If switchyard voltage was at the minimum allowed voltage of 230kV, the increased load on the affected train could cause a reduction of bus voltage sufficient to initiate the degraded voltage protection scheme. St. Lucie Unit 2 has sufficient margin to preclude separation of the offsite power system in this alignment. St. Lucie Unit 1 does not have margin, and offsite power could be disconnected in this scenario, and therefore results in an unanalyzed condition reportable pursuant to 10 CFR 50.73(a)(2)(ii)(B).

After the GL 96-06 modifications were complete, the above Unit 1 response to a LOOP/LOCA would also result in the loss of the affected EDG. This could result in the complete loss of CCW flow if the unaffected electrical train did not have an operable CCW pump aligned to it. The complete loss of CCW flow for Unit 1 is reportable pursuant to 10 CFR 50.73(a)(2)(v)(D) as a loss of safety function needed to mitigate the effects of an accident.

Analysis of Safety Significance

Operation of two CCW pumps or two ICW pumps on the same electrical train is an infrequent transient event. Based on July, 2006 data for CCW pump swapping, the duration for two CCW pumps being on the same bus is approximately 5 minutes or less. Similar exposure times are assumed for ICW pump swaps. Assuming 12 pump swaps each month yields 60 minutes of total exposure time when EDG may be overloaded due to CCW pumps or ICW pumps. The assumption of 12 pump swaps each month is very conservative, as actual plant operation results in significantly fewer pump swaps.

Over a year, the exposure time is approximately 12 hours. An estimate using the St. Lucie Unit 1 On-Line-Risk Monitor by taking one EDG out of service produces an increase of Core Damage Probability of approximately 1.2E-8 per day. Assuming 20

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hours of exposure time per year would produce an increase of Core Damage Probability of 1.0E-8. This is below 1.0E-6 threshold for risk significance. Therefore, the identified condition had no significant effect on the health and safety of the public.

Corrective Actions

The proposed corrective actions and supporting actions listed below are entered into the site corrective action program. Any changes to the proposed actions will be managed under the commitment management change program.

1. Interim corrective actions have been implemented which installed warning placards on the Units 1 and 2 CCW and ICW pump control switches to alert operators that running the 1C/2C CCW or ICW pump on the same electrical train requires entry into Technical Specifications LCOs. (Complete)
2. Modification packages will be prepared to modify the circuits of CCW Pumps 1C and 2C to restore the bus load shed trip of the circuit breaker and reclosure upon restoration of power to the bus. This addresses the scenario of loading two CCW pumps on the same EDG.
3. Design documents for the Units 1 & 2 Component Cooling Water and Intake Cooling Water systems will be revised to incorporate information relating to the momentary paralleling of running pumps when starting the 1C/2C CCW/ICW pumps, as described in the current CCW and ICW system operating procedures, to address the discrepancy between design documentation and CCW/ICW system procedures.
4. Plant Procedures for Unit 1 will be revised to address the effects on the Unit 1 EDG loading due to operation of two CCW pumps on the same electrical train by requiring the associated EDG to be declared INOPERABLE (Unit 1 Modes 1 through 4) in this event. In addition, due to the effects on the degraded voltage relays of running two CCW or two ICW pumps on the same electrical train, the associated offsite power source is declared INOPERABLE (Unit 1 Modes 1 through 4 without a SIAS signal block) for this scenario.
5. Plant Procedures for both Units 1 and 2 will be revised to reflect that operation with two CCW pumps on one electrical train and no CCW pump available on the other (i.e. starting the 1C or 2C CCW pump to replace a failed CCW pump without prior alignment to the failed pump power supply) is not permitted. Realignment of the electrical power for the C CCW pump will be required prior to starting the pump. This prevents a subsequent failure of one electrical train resulting in total loss of CCW flow.
6. The design change process is to be reviewed for improvement opportunities to ensure design changes consider system and component operations.

Similar Events

A review of PSL Condition Reports identified no similar events.

Failed Components

None